PATENT ABSTRACTS OF JAPAN

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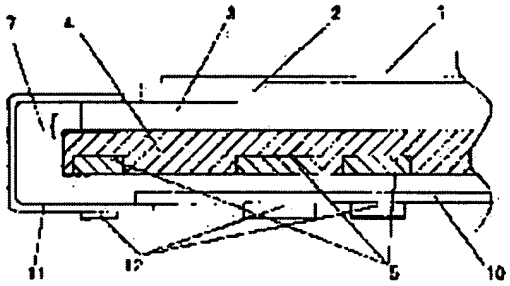
(54) RADIATION DETECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the weight and thickness of a radiation detector without lowering the mechanical strength significantly.

SOLUTION: The radiation detector comprises means for converting radiation into an electric signal, a supporting member for mounting the converting means, and means for processing the converted electric signal disposed on the rear side of the supporting member wherein a recess is made in the supporting member in correspondence with the position of the processing means and a material for shielding radiation to the supporting member is buried in the recess.



LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] In the radiation detection instrument equipped with a conversion means to change a radiation into an electrical signal, the supporter material, in which said conversion means is laid, and a processing means to process the electrical signal which is formed in the rear-face side of said supporter material, and was changed with said conversion means The radiation detection instrument characterized by forming a crevice according to the location where said processing means was formed in said supporter material, and laying under this crevice the shielding material which covers the radiation to said processing means.
[Claim 2] The radiation detection instrument according to claim 1 characterized by making magnitude of said shielding material into the magnitude beyond said processing means.
[Claim 3] The relation between said crevice depth d and thickness t of said shielding material is d. >= Radiation detection instrument according to claim 1 or 2 characterized by being t.
[Claim 4] Said conversion means is the radiation detection instrument of a publication of three given in any 1 term from claim 1 characterized by changing into an electrical signal once changing a radiation into light.
[Claim 5] Said processing means is the radiation detection instrument of four given in any 1 term from claim 1 characterized by being the integrated circuit mounted in the flexible substrate connected to said conversion means.
[Claim 6] The radiation detection system characterized by having the radiation detection instrument of five given in any 1 term from claim 1.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to radiation detection instruments, such as X-ray detection equipment, an industrial destructor-ed, etc. of medical application, about a radiation detection instrument.
[0002] In addition, on these specifications, electromagnetic waves, such as alpha rays, beta rays, and a gamma ray, shall also be included under the category of a radiation.
[0003]
[Description of the Prior Art] In recent years, by development of the photo-electric-conversion semiconductor material represented by amorphous silicon (a-Si), development of the two-dimensional sensor which formed many optoelectric transducers in two-dimensional on the large area substrate progresses, and it has resulted in utilization. The two-dimensional sensor for X-rays which mainly images an X-ray image as diagnostic equipment of medical application is in such a two-dimensional sensor.
[0004] It is mainly divided into the two-dimensional sensor for X-rays by 2 of an indirect conversion method and a direct conversion method methods by the difference in the conversion method of an X-ray. An indirect conversion method changes an X-ray into the light with a fluorescent substance, changes this light into a charge by the optoelectric transducer, and reads that charge through a transistor. On the other hand, a direct conversion method carries out direct conversion of the X-ray to a charge, and reads the charge through a transistor.
[0005] In the two-dimensional sensor for X-rays as medical application, a two-dimensional sensor for X-rays of a non-portable type and a portable mold is desired like the conventional screen / film system, and small and light weight, and thin shape-ization is especially desired in the two-dimensional sensor for X-rays of a portable mold.
[0006] Drawing 3 is the type section Fig. having shown typically the cross section of the X-ray detection equipment which used the indirect conversion method two-dimensional sensor. Drawing 4 is drawing seen from under drawing 3 . In drawing 3 and drawing 4 , a fluorescent substance for 1 to change an X-ray into the light, the sensor section which allotted the pixel which 2 becomes from an optoelectric transducer and a transistor two-dimensional, the pedestal which 3 becomes from insulating ingredients, such as glass, and 4 are the support plates for raising the mechanical strength which consists of metallic materials, such as comparatively lightweight Mg alloy. Adhesion immobilization of a fluorescent substance 1, the sensor section 2 and a pedestal 3, and the support plate 4 is respectively carried out by the binder.
[0007] Moreover, 5 is an X-ray shielding material which absorbs or covers the X-ray which consisted of ingredients with the comparatively large atomic number, such as Pb, and penetrated the fluorescent substance 1, and is concluded by the support plate 4 according to adhesion or ****. 7 is supporter material and consists of a pedestal 3 and a support plate 4. Flexible wiring for an electrical circuit substrate for 10 to process the signal acquired from the sensor section 2 and 11 to connect electrically the sensor section 2 and the electrical circuit substrate 10 and 12 are the drive of the sensor section 2, and an integrated circuit (IC) for transmitting and processing the signal acquired from the sensor section 2.
[0008] Next, actuation of the X-ray detection equipment shown in drawing 3 and drawing 4 is explained. Light conversion of the X-ray irradiated from the X-ray generator is carried out with a fluorescent substance 1, and the charge according to the quantity of light is accumulated in the optoelectric transducer in the sensor section 2. The charge accumulated in the optoelectric transducer is read as an electrical potential difference through the transistor in the sensor section 2, the flexible wiring 11, and IC12. By IC12 on the electrical circuit substrate 10, suitable processing is performed and the read electrical potential difference (information) obtains an image.
[0009] By the way, if the X-ray irradiated by the field without a fluorescent substance 1 and the X-ray penetrated without carrying out light conversion with a fluorescent substance 1 are irradiated by IC12 on the flexible wiring 11 or the electrical circuit substrate 10, it will become malfunction of IC12, and the cause of property degradation. In order to avoid this problem, the X-ray shield 5 of the almost same magnitude as the magnitude within the X-ray irradiation side

of a support plate 4 is formed between the support plate 4 and the electrical circuit substrate 10.
[0010] In addition, in consideration of the engine performance and endurance of equipment, it is practically decided to X dosage by which thickness t of the X-ray shield 5 is irradiated practically that an X-ray is covered to the level on which IC12 operates satisfactory.
[0011]
[Problem(s) to be Solved by the Invention] However, the Prior art was with the factor which the thickness of X-ray detection equipment increases by the thickness of an X-ray shield, and bars thin shape-ization. Although how to make supporter material thin by the thickness of an X-ray shield as a means to avoid this can be considered, the new problem that the mechanical strength of a support plate falls remarkably in this case arises.
[0012] Moreover, since the Prior art was considering as a configuration an X-ray is not irradiated by whose whole surface of an electrical circuit substrate and IC on flexible wiring, even if the X-ray was irradiated, wiring on the electrical circuit substrate which is satisfactory practically etc. has arranged the X-ray shield to fields other than IC, and had the problem that X-ray picture detection equipment weight-ized by this.
[0013] Then, without reducing a mechanical strength remarkably, a radiation detection instrument is made as lightweight-ization, and this invention makes it a technical problem to thin-shape-ize.
[0014]
[Means for Solving the Problem] A conversion means by which this invention changes a radiation into an electrical signal in order to solve the above-mentioned technical problem, In the radiation detection instrument equipped with the supporter material in which said conversion means is laid, and a processing means to process the electrical signal which is formed in the rear-face side of said supporter material, and was changed with said conversion means A crevice is formed according to the location where said processing means was formed in said supporter material, and it is characterized by laying under this crevice the shielding material which covers the radiation to said processing means.
[0015]
[Embodiment of the Invention] Hereafter, it explains, referring to a drawing about the operation gestalt of this invention.
[0016] (Operation gestalt 1) Drawing 1 is the typical sectional view of the X-ray detection equipment of the operation gestalt 1 of this invention. The X-ray detection equipment which used the so-called indirect conversion method two-dimensional sensor is shown in drawing 1 . Drawing 2 is drawing seen from under drawing 1 .
[0017] The crevice is formed according to the mounting position of IC12 which a fluorescent substance for 1 to change an X-ray into the light, the sensor section which allotted the pixel which 2 becomes from an optoelectric transducer and a transistor two-dimensional, the pedestal which 3 becomes from insulating ingredients, such as glass, and 4 are the support plates for raising the mechanical strength which consists of metallic materials, such as comparatively lightweight Mg alloy, in drawing 1 and drawing 2 , and is explained below. Adhesion immobilization of a fluorescent substance 1, the sensor section 2 and a pedestal 3, and the support plate 4 is respectively carried out by the binder.
[0018] Moreover, 15 is an X-ray shielding material which absorbs or covers the X-ray which consisted of ingredients with the comparatively large atomic number, such as Pb, and penetrated the fluorescent substance 1, and is laid underground in the crevice of the magnitude beyond the field where the X-ray of IC12 is irradiated at the electrical circuit substrate 10 side of a support plate 4. 7 is supporter material and consists of a pedestal 3 and a support plate 4. Flexible wiring for an electrical circuit substrate for 10 to process the signal acquired from the sensor section 2 and 11 to connect electrically the sensor section 2 and the electrical circuit substrate 10 and 12 are the drive of the sensor section 2, and an integrated circuit (IC) for transmitting and processing the signal acquired from the sensor section 2.
[0019] With this operation gestalt, it is processed so that two or more crevices may be established in the supporter material 7, and the X-ray shielding material 15 is laid under these two or more crevices. For this reason, as compared with the X-ray detection equipment which it has, respectively,-izing of the supporter material 7 which is not processed and the X-ray shield 5 (drawing 3) can be carried out [thin shape] by the thickness of the X-ray shield 5. Moreover, only the part which deducted the weight of the X-ray shielding material 15 laid under the crevice of the supporter material 7 from the weight of the X-ray shield 5 can carry out [lightweight]-izing.
[0020] Moreover, the depth of the crevice of the supporter material 7 is d, when it is carrying out more than the thickness of the X-ray shield 5, namely, thickness of d and the X-ray shielding material 15 is set to t for the crevice depth of the supporter material 7. >= Since it has the relation of t, he is trying for the X-ray shielding material 15 not to project from the front face of the supporter material 7. In addition, since the supporter material 7 has only established the crevice only in the upper part of IC12, a mechanical strength does not fall so much. What is necessary is incidentally, for it to be light, and to replace the ingredient of the supporter material 7 with a thing with reinforcement, and just to thicken it, if it seems that the mechanical strength of the supporter material 7 falls.
[0021] The X-ray which forms the X-ray shielding material 15 in the place near IC12, and advances aslant to IC12 by arranging with this operation gestalt here to the travelling direction of the X-ray irradiated from X line source in order of the supporter material 7, the X-ray shielding material 5, and the electrical circuit substrate 10 is made easy to cover.

If it puts in another way, even if it makes small area of the X-ray shielding material 15, the X-ray which advances aslant can be covered.
[0022] On the other hand, in the case of the non-portable X-ray detection equipment which photos a specific part with medical application, the physical relationship with X line source was decided about. Moreover, the X-ray irradiated from X line source is emission light. In this case, the shadow of the X-ray shielding material 5 projected on IC12 becomes large, so that the X-ray shielding material 15 is far from IC12, namely, since large electric shielding area can be taken, the X-ray shielding material 15 and the permissible position error of IC12 can be enlarged. Or the X-ray irradiated by IC12 in a small area can be covered.
[0023] Then, the X-ray detection equipment of medical application is good to lay the X-ray shielding material 5 under the pedestal 3 side of a support plate 4.
[0024] In addition, as shown in drawing 5 , a crevice may be established in a pedestal 3, and the X-ray shielding material 5 may be laid underground there.
[0025] Furthermore, with this operation gestalt, although the so-called X-ray image pick-up equipment of an indirect conversion method was explained to the example, even if it is the so-called radiation detection instrument of a direct conversion method, the X-ray shielding material 5 can be formed similarly.
[0026] (Operation gestalt 2) Drawing 6 is the typical block diagram of the X-ray detection system of the operation gestalt 2 of this invention. X-ray 6060 generated by the X-ray tube 6050 penetrates the thorax 6062 of a patient or a test subject 6061, and it carries out incidence to a radiation detection instrument 6040. The information inside a patient's 6061 body is included in this X-ray that carried out incidence. Corresponding to the incidence of an X-ray, a fluorescent substance emits light, carries out photo electric conversion of this, and acquires electric information. This information is changed into digital one, and an image processing is carried out by the image processor 6070, and it can be observed on the display 6080 of control room.
[0027] Moreover, this information can be transmitted to a remote place with the transmission means of telephone-line 6090 grade, it can save on the displays 6081, such as a doctor room of somewhere else, at preservation means, such as a display or an optical disk, and the medical practitioner of a remote place is able to diagnose. Moreover, it is also recordable on a film 6110 with the film processor 6100.
[0028] In addition, although this operation gestalt explained the case where photo-electric-conversion equipment was applied to a diagnostic X-ray system, it is applicable also to radiation image pick-up systems, such as nondestructive inspection equipment using radiations, such as alpha rays other than an X-ray, beta rays, and a gamma ray.
[0029]
[Effect of the Invention] since the shielding material is prepared only for the proper place according to this invention as explained above, while covering the radiation to a processing means -- a radiation detection instrument -- lightweight-izing -- it can thin-shape-ize.

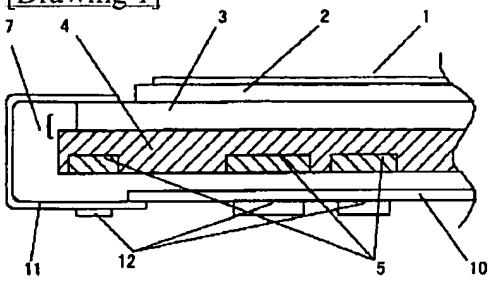
[Translation done.]

* NOTICES *

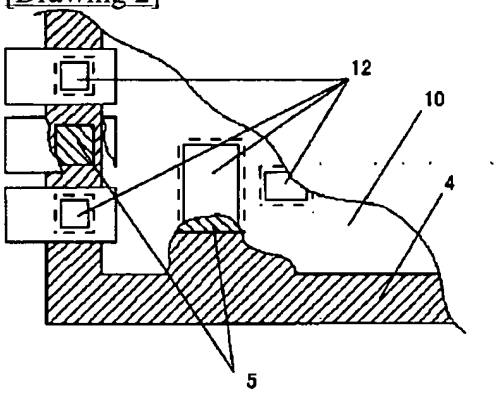
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

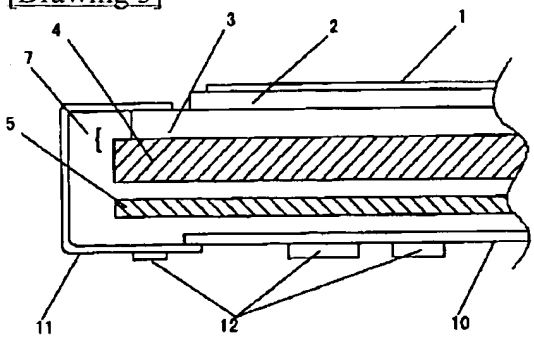
[Drawing 1]



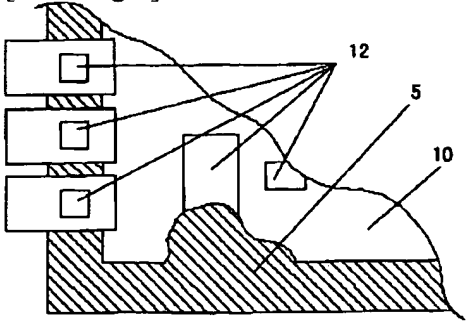
[Drawing 2]



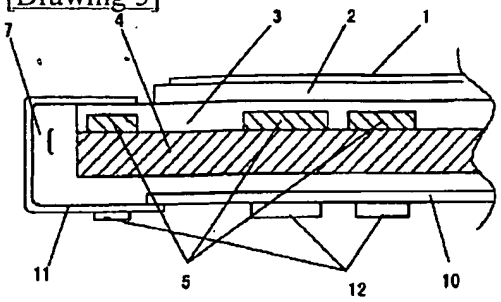
[Drawing 3]



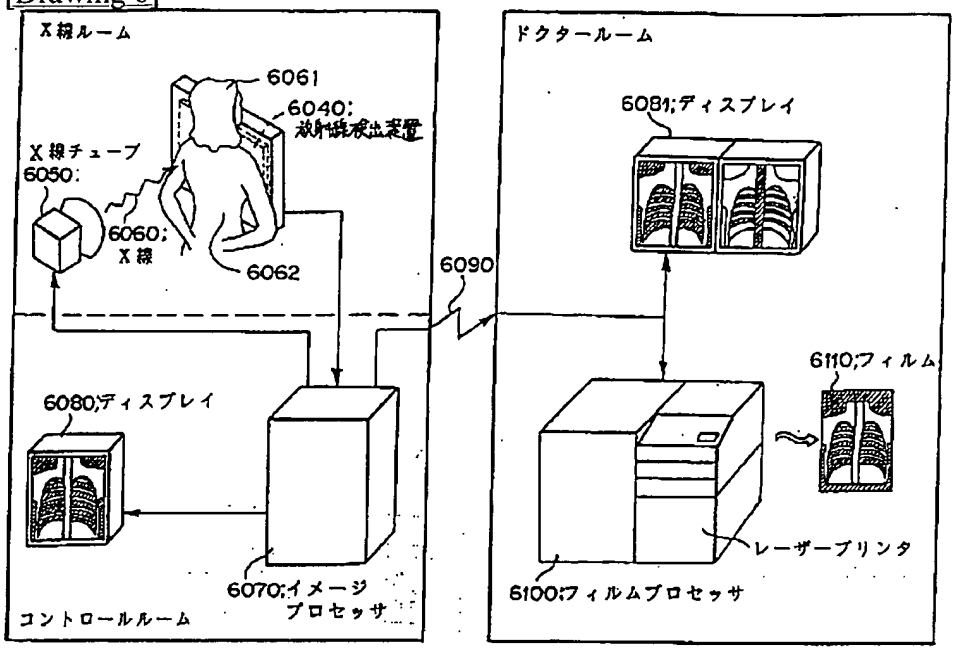
[Drawing 4]



[Drawing 5]



[Drawing 6]



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